MERS-CoV Guidance for Healthcare and Public Health Providers
Michigan Department of Community Health

This interim guidance outlines Michigan Department of Community Health (MDCH) recommendations on surveillance, reporting, testing, and infection control for healthcare providers for Middle East Respiratory Syndrome (MERS). MERS is caused by a coronavirus called MERS-CoV and was first reported in Saudi Arabia in 2012. Most people who have been confirmed to have MERS-CoV infection developed severe acute respiratory illness, and about half have died. The most commonly reported symptoms included fever, cough, and shortness of breath. Most patients had abnormal findings on chest x-ray.

At this time, all cases have been linked to countries in or near the Arabian Peninsula. To date, no cases have been reported in the United States. The virus has spread from ill people to others through close contact. However, no current evidence exists for sustained human-to-human transmission. ***Michigan healthcare providers should be vigilant for suspect cases.*** Future updates may be issued if MERS-CoV severity, activity, or transmission changes. For more information please see: http://www.cdc.gov/coronavirus/mers/ or call the MDCH Division of Communicable Disease at 517-335-8165.

General Guidance on Case Identification, Reporting, Testing, and Infection Control

1. ***Patients who develop fever and pneumonia or acute respiratory distress syndrome should be asked about travel within 14 days from the Arabian Peninsula or neighboring countries or close contact with an ill traveler from the region.*** Healthcare professionals should evaluate suspected cases of MERS-CoV infection according to the CDC patient under investigation (PUI) definition (*page 2*). Persons who meet the criteria for PUI should also be evaluated for common causes of community-acquired pneumonia.[1] Positive results for another respiratory pathogen should not necessarily preclude testing for MERS-CoV.

2. ***Healthcare providers should immediately report confirmed or probable PUIs to their state or local health department.***[2] To collect data on PUIs, fill out the Michigan MERS PUI short form found at http://www.michigan.gov/documents/mdch/MERS_Investigation_ShortForm_438699_7.pdf Healthcare providers should FAX completed investigation short forms to MDCH at (517-335-8263).

3. ***Specimens from PUIs should be submitted to MDCH.*** Contact your local health department or MDCH immediately to report suspect cases and to arrange prior approval for testing. For more information, see Interim Guidelines for Collecting, Handling and Testing Clinical Specimens from PUIs (*pages 4-6*).

4. ***Appropriate infection-control measures including initiating contact / airborne precautions should be instituted while managing a patient with known or suspected MERS-CoV infection.*** For CDC guidance on MERS-CoV infection control in healthcare settings, see Infection Prevention and Control (*page 3*).

5. ***Any person who has had close contact with a confirmed case, probable case, or PUI while the person was ill, should be carefully monitored for the appearance of illness.*** If fever and respiratory symptoms develops within the first 14 days following the contact, the individual should be evaluated for MERS-CoV infection. See Case Definitions (*page 2*) for the definition of a close contact.

6. ***Clusters of severe acute respiratory illness (SARI) should be evaluated for common respiratory pathogens.*** Clusters[3] should be thoroughly investigated with immediate notification to your local health department. MERS-CoV testing should be considered in consultation with MDCH.

7. ***CDC Preparedness Checklists for Healthcare Providers and Healthcare Facilities are included*** (*pages 7-9).*

[1]Examples of respiratory pathogens causing community-acquired pneumonia include influenza A and B, respiratory syncytial virus, *Streptococcus pneumoniae*, and *Legionella pneumophila*.
[2]For local health department contact information, see http://www.michigan.gov/mdch/0,4612,7-132-2939-96747--,00.html
[3]A cluster is defined as two or more persons with onset of symptoms within the same 14 days period, and who are associated with a specific setting such as a classroom, workplace, household, extended family, hospital, other residential institution, military barracks, or recreational camp.

Case Definitions

Patient Under Investigation (PUI)

Clinicians and health care professionals should immediately report PUIs for MERS-CoV infection to their state or local health department. State and local health departments should immediately report PUIs for MERS-CoV infection to CDC. Probable cases should also be reported.

A patient under investigation (PUI) is a person with the following characteristics:

- fever (≥38°C, 100.4°F) and pneumonia or acute respiratory distress syndrome (based on clinical or radiological evidence);

AND EITHER

- history of travel from countries in or near the Arabian Peninsula[1] within 14 days before symptom onset;

OR

- close contact[2] with a symptomatic traveler who developed fever and acute respiratory illness (not necessarily pneumonia) within 14 days after traveling from countries in or near the Arabian Peninsula;[1]

OR

- is a member of a cluster of patients with severe acute respiratory illness (e.g. fever and pneumonia requiring hospitalization) of unknown etiology in which MERS-CoV is being evaluated, in consultation with state and local health department.

Confirmed Case:

- A confirmed case is a person with laboratory confirmation[3] of MERS-CoV infection.

Probable Case:

- A probable case is a PUI with absent or inconclusive[4] laboratory results for MERS-CoV infection who is a close contact[2] of a laboratory-confirmed MERS-CoV case.

Footnotes

1. Countries considered in or near the Arabian Peninsula: Bahrain, Iraq, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Palestinian territories, Qatar, Saudi Arabia, Syria, the United Arab Emirates (UAE), and Yemen.
2. Close contact is defined as a) any person who provided care for the patient, including a healthcare worker or family member, or had similarly close physical contact; or b) any person who stayed at the same place (e.g. lived with, visited) as the patient while the patient was ill.
3. Confirmatory laboratory testing requires a positive PCR on at least two specific genomic targets or a single positive target with sequencing on a second (the latter is not available at MDCH Laboratories).
4. Examples of laboratory results that may be considered inconclusive include a positive test on a single PCR target, a positive test with an assay that has limited performance data available, or a negative test on an inadequate specimen.

Infection Prevention and Control

Standard, contact, and airborne precautions are recommended for management of hospitalized patients with known or suspected MERS-CoV infection, based on CDC's case definition for patient under investigation. These recommendations are consistent with those recommended for the coronavirus that caused severe acute respiratory syndrome (SARS). These recommendations will be re-evaluated and updated as needed.

Selected Components of Standard, Contact, and Airborne Precautions Recommended for Prevention of MERS-CoV Transmission in Hospitals

Component	Recommendation(s)	Comments
Patient placement	• Airborne Infection Isolation Room (AIIR)	• If an AIIR is not available, the patient should be transferred as soon as is feasible to a facility where an AIIR is available. Pending transfer, place a facemask on the patient and isolate him/her in a single-patient room with the door closed. The patient should not be placed in any room where room exhaust is recirculated without high-efficiency particulate air (HEPA) filtration. • Once in an AIIR, the patient's facemask may be removed; the facemask should remain on if the patient is not in an AIIR. • When outside of the AIIR, patients should wear a facemask to contain secretions • Limit transport and movement of the patient outside of the AIIR to medically-essential purposes. • Implement staffing policies to minimize the number of personnel that must enter the room.
Personal Protective Equipment (PPE) for Healthcare personnel (HCP)	• Gloves • Gowns • Eye protection (goggles or face shield) • Respiratory protection that is at least as protective as a fit-tested NIOSH-certified disposable N95 filtering facepiece respirator. ○ If a respirator is unavailable, a facemask should be worn. In this situation respirators should be made available as quickly as possible.	• Recommended PPE should be worn by HCP upon entry into patient rooms or care areas. • Upon exit from the patient room or care area, PPE should be removed and either ○ Discarded, or ○ For re-useable PPE, cleaned and disinfected according to the manufacturer's reprocessing instructions
Environmental Infection Control	• Follow standard procedures, per hospital policy and manufacturers' instructions, for cleaning and/or disinfection of: ○ Environmental surfaces and equipment ○ Textiles and laundry ○ Food utensils and dishware	

For full details of these precautions, see 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings at http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html

Guidance for care and management of MERS-CoV patients in the home and guidance for close contacts of these patients can be found at http://www.cdc.gov/coronavirus/mers/hcp/home-care.html

Of note, CDC has determined that federal isolation and quarantine are authorized for MERS-CoV under Executive Order 13295 at http://www.cdc.gov/quarantine/aboutlawsregulationsquarantineisolation.html

Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Patients Under Investigation (PUIs) for MERS-CoV

Before collecting and handling specimens for MERS-CoV testing, determine whether the person meets the current definition for a "patient under investigation" (PUI) for MERS-CoV infection prepared by the Centers for Disease Control and Prevention (CDC). See http://www.cdc.gov/coronavirus/mers/case-def.html

Specimen Type and Priority

To date, little is known about pathogenic potential and transmission dynamics of MERS-CoV. To increase the likelihood of detecting infection, CDC recommends collecting multiple specimens from different sites at different times after symptom onset, if possible.

Points to consider when determining which specimen types to collect from a patient under investigation for MERS include:

- The number of days between specimen collection and symptom onset
- Symptoms at the time of specimen collection

Additional points to consider:

- Maintain proper infection control when collecting specimens
- Use approved collection methods and equipment when collecting specimens
- Handle, store, and ship specimens following appropriate protocols

Lower respiratory specimens are preferred, but collecting nasopharyngeal and oropharyngeal (NP/OP) specimens, as well as stool and serum, are strongly recommended depending upon the length of time between symptom onset and specimen collection. For example, if symptom onset for a PUI with ongoing lower respiratory tract infection was 14 or more days ago, a single serum specimen for serologic testing (see Section II. Blood Components – Serum) in addition to a lower respiratory specimen and an NP/OP specimen (see Section I. Respiratory Specimens) are recommended.

Respiratory specimens should be collected as soon as possible after symptoms begin – ideally within 7 days and before antiviral medications are administered. However, if more than a week has passed since symptom onset and the patient is still symptomatic, respiratory samples should still be collected, especially lower respiratory specimens since respiratory viruses can still be detected by rRT-PCR.

General Guidelines

For short periods (≤ 72 hours), most specimens should be held at 2-8^{o}C rather than frozen. For delays exceeding 72 hours, freeze specimens at -70^{o}C as soon as possible after collection (with exceptions noted below). Label each specimen container with the patient's ID number, specimen type and the date the sample was collected.

I. Respiratory Specimens

A. Lower respiratory tract

i. Broncheoalveolar lavage, tracheal aspirate
Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container. Refrigerate specimen at 2-8^{o}C up to 72 hours; if exceeding 72 hours, freeze at -70^{o}C and ship on dry ice.

ii. Sputum
Have the patient rinse the mouth with water and then expectorate deep cough sputum directly into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container. Refrigerate specimen at 2-8^{o}C up to 72 hours; if exceeding 72 hours, freeze at -70^{o}C and ship on dry ice.

B. Upper respiratory tract

i. Nasopharyngeal AND oropharyngeal swabs (NP/OP swabs)
Use only synthetic fiber swabs with plastic shafts. Do not use calcium alginate swabs or swabs with wooden shafts, as they may contain substances that inactivate some viruses and inhibit PCR testing. Place swabs immediately into sterile tubes containing 2-3 ml of viral transport media. NP/OP specimens can be combined, placing both swabs in the same vial. Refrigerate specimen at 2-8^{o}C up to 72 hours; if exceeding 72 hours, freeze at -70^{o}C and ship on dry ice.

Nasopharyngeal swabs -- Insert a swab into the nostril parallel to the palate. Leave the swab in place for a few seconds to absorb secretions. Swab both nasopharyngeal areas.

Oropharyngeal swabs -- Swab the posterior pharynx, avoiding the tonsils and tongue.

ii. Nasopharyngeal wash/aspirate or nasal aspirates
Collect 2-3 mL into a sterile, leak-proof, screw-cap sputum collection cup or sterile dry container. Refrigerate specimen at 2-8^{o}C up to 72 hours; if exceeding 72 hours, freeze at -70^{o}C and ship on dry ice.

II. Blood Components

A. Serum (for serologic testing)
For serum antibody testing: Serum specimens should be collected during the acute stage of the disease, preferably during the first week after onset of illness, and again during convalescence, ≥ 3 weeks after the acute sample was collected. However, since we do not want to delay detection at this time, a single serum sample collected 14 or more days after symptom onset may be beneficial. Serologic testing is currently available at CDC upon request and approval. Please be aware that the MERS-CoV serologic test is for research/surveillance purposes and not for diagnostic purposes – it is a tool developed in response to the MERS-CoV outbreak. Contact MDCH (517-335-8165) for consultation and approval regarding serologic testing.

B. Serum (for rRT-PCR testing)
For rRT-PCR testing (i.e., detection of the virus and not antibodies), a single serum specimen collected optimally during the first week after symptom onset, preferably within 3-4 days, after symptom onset, may be also be beneficial. *NOTE: These time frames are based on SARS-CoV studies. The kinetics of MERS-CoV are not well understood and may differ from SARS-CoV. Once additional data become available, these recommendations will be updated as needed.*

Children and adults. Collect 1 tube (5-10 mL) of whole blood in a serum separator tube. Allow the blood to clot, centrifuge briefly, and separate sera into sterile tube container. The minimum amount of serum required for testing is 200 µL. Refrigerate the specimen at 2-8^{o}C and ship on ice- pack; freezing and shipment on dry ice is permissible.

Infants. A minimum of 1 mL of whole blood is needed for testing of pediatric patients. If possible, collect 1 mL in an EDTA tube and in a serum separator tube. If only 1 mL can be obtained, use a serum separator tube.

III. Stool

Collect 2-5 grams of stool specimen (formed or liquid) in sterile, leak-proof, screw-cap sputum collection cup or sterile dry container. Refrigerate specimen at 2-8^{o}C up to 72 hours; if exceeding 72 hours, freeze at -70^{o}C and ship on dry ice.

IV. Shipping

Specimens from suspected MERS cases must be packaged, shipped, and transported according to the current regulations.

Specimens should be stored and shipped at the temperatures indicated above. If samples are unable to be shipped within 72 hours of collection, they should be stored at -70°C and shipped on dry ice.

For additional information, contact MDCH at 517-335-8165. Specimens should be shipped for overnight delivery. If Saturday delivery is planned, special arrangements must be made with the shipping company.

Summary of MERS-CoV rRT-PCR Testing Guidelines for Respiratory Specimens

Testing for MERS-CoV and other respiratory pathogens can be done simultaneously. Virus isolation in cell culture and initial characterization of viral agents recovered in cultures of MERS-CoV specimens are NOT recommended at this time. However, if done, these activities must be performed in a BSL-3 facility using BSL-3 work practices.

Test for MERS-CoV

MDCH Bureau of Laboratories is approved for MERS-CoV testing using the CDC rRT-PCR assay. Contact your local health department or MDCH at 517-335-8165 to coordinate testing as prior approval is required. The local investigation and response, including the contact investigation, should not be delayed pending the receipt of laboratory results.

Test for Other Respiratory Pathogens

Testing for common respiratory pathogens by molecular or antigen detection methods (not by viral culture) is strongly recommended. Common respiratory pathogens include 1) influenza A, influenza B, respiratory syncytial virus, human metapneumovirus, human parainfluenza viruses, adenovirus, human rhinovirus and other respiratory viruses; 2) *Streptococcus pneumoniae*, *Chlamydia pneumophila*, and other pathogens that cause severe lower respiratory infections. Clinical presentation, epidemiologic and surveillance information, and season should be considered when selecting which pathogens to test for. A few MERS-CoV cases have had other respiratory pathogens detected, so identification of a respiratory pathogen prior to MERS-CoV testing should not preclude testing for MERS-CoV, especially if MERS is strongly suspected. If your laboratory does not have molecular or antigen testing capability for respiratory pathogens, contact MDCH Bureau of Laboratories.

Healthcare Provider Preparedness Checklist for MERS-CoV

Front-line healthcare providers in the United States should be prepared to evaluate patients for new and emerging infectious diseases such as Middle East Respiratory Syndrome Coronavirus (MERS-CoV). The following checklist highlights key steps for healthcare providers to take in preparation for transport and arrival of patients potentially infected with MERS-CoV.

- ☐ Stay up to date on the latest information about signs and symptoms, diagnostic testing, and case definitions for MERS-CoV disease (http://www.cdc.gov/coronavirus/mers/case-def.html)
- ☐ Review your infection control policies and CDC infection control recommendations for MERS-CoV http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html for:
  - ☐ Assessment and triage of acute respiratory infection patients
  - ☐ Patient placement
  - ☐ Visitor management and exclusion
  - ☐ Personal protective equipment (PPE) for healthcare personnel
  - ☐ Source control measures for patients (e.g., put facemask on suspect patients)
  - ☐ Requirements for performing aerosol generating procedures
- ☐ Be alert for patients who meet the MERS-CoV case definition (http://www.cdc.gov/coronavirus/mers/case-def.html)
- ☐ Promptly implement source control for potential MERS-CoV patients before transport or upon entry to the facility and triage according to facility plans (e.g., place in private room) for evaluation
- ☐ Know how to report a potential MERS-CoV case or exposure to facility infection control leads and public health officials
- ☐ Know who, when, and how to notify and when to seek evaluation by occupational health following an unprotected exposure (i.e., not wearing recommended PPE) to a suspected or confirmed MERS-CoV patient
- ☐ Know how to contact and receive information from your state or local public health agency
- ☐ Remain at home if you are ill

For more information, visit http://www.cdc.gov/coronavirus/mers/preparedness/checklist-provider-preparedness.html

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Healthcare Facility Preparedness Checklist

All U.S. healthcare facilities need to be prepared for new and emerging infectious disease threats such as Middle East Respiratory Syndrome Coronavirus (MERS-CoV). All hospitals should be equipped and ready to care for a limited number of infected patients as part of routine operations and also to potentially care for a larger number of patients in the context of escalating transmission. Facilities should outline plans for administrative, environmental, and communication measures and define the individual work practices that will be required to detect the introduction of MERS-CoV or other emerging infectious diseases, prevent spread, and manage the impact on patients, the facility, and staff.

The following checklist highlights some key areas for healthcare facilities to review in preparation for MERS-CoV. The checklist format is not intended to set forth mandatory requirements or establish national standards.

- ☐ Ensure facility infection control policies are consistent with the Centers for Disease Control and Prevention's MERS-CoV guidance (http://www.cdc.gov/coronavirus/mers/infection-prevention-control.html)
- ☐ Review procedures for rapidly implementing appropriate isolation and infection practices for potential MERS-CoV patients
- ☐ Review policies and procedures for screening and work restrictions for exposed or ill HCP including ensuring that HCP have ready access, including via telephone, to medical consultation
- ☐ Review procedures for laboratory submission of specimens for MERS-CoV testing
- ☐ Review plans for implementation of surge capacity procedures and crisis standards of care
- ☐ Develop plans for visitor restriction if MERS-CoV is circulating in the community
- ☐ Ensure that specific persons have been designated within the facility who are responsible for communication with public health officials and dissemination of information to other HCP at the facility
- ☐ Confirm the local or state health department contact for reporting MERS-CoV cases and confirm reporting requirements
- ☐ Assure ability to implement triage activities based on public health guidance including at the facility and using remote (i.e., phone, internet-based) methods where appropriate to minimize demand on the health care system
- ☐ Ensure that negative-pressure airborne infection isolation rooms are functioning correctly and are appropriately monitored for airflow and exhaust handling
- ☐ Ensure that HCP who will provide patient-care have been medically cleared, fit-tested, and trained for respirator use
- ☐ Provide education and refresher training in the next six weeks to HCP regarding MERS-CoV diagnosis, how to obtain specimen testing, appropriate PPE use, triage procedures including patient placement, HCP sick leave policies, and how and to whom MERS-CoV cases should be reported, procedures to take following unprotected exposures (i.e., not wearing recommended PPE) to suspected MERS-CoV patients at the facility

- ☐ Assess availability of personal protective equipment (PPE) and other infection control supplies (e.g., hand hygiene supplies) that would be used for both healthcare personnel (HCP) protection and source control for infected patients (e.g., facemask on the patient)
- ☐ Have contingency plans if the demand for PPE or other supplies exceeds supply
- ☐ Assess effectiveness of environmental cleaning procedures; provide education/refresher training for cleaning staff (http://www.cdc.gov/hai/toolkits/evaluating-environmental-cleaning.html)
- ☐ Monitor the situation at CDC's MERS website: http://www.cdc.gov/coronavirus/mers/index.html

For more information, visit http://www.cdc.gov/coronavirus/mers/preparedness/checklist-facility-preparedness.html

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